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PREVALENCE OF PERIPHERAL NEUROPATHY IN CHRONIC MUSCULOSKELETAL OEDEMATOUS CONDITIONS

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ABSTRACT

Background: Neuropathic pain is a compound, persistent pain condition that results from illness or damage to the peripheral nervous system, central nervous system, or both. The nerve might get compressed due to various factors but one of the causes is an increase in oncotic pressure of interstitial fluid which may lead to neuropraxia. So, this may lead to symptoms of peripheral neuropathy. The objectives of the study were to determine the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions and to study the association of peripheral neuropathy in chronic musculoskeletal oedematous conditions with demographic variables.

Methods: A total of 52 subjects were assessed and all were included in the study based on inclusion criteria. Peripheral neuropathy was diagnosed using Modified Total Neuropathy Score (mTNS) and pain assessment using Visual Analogue Scale (VAS), oedema assessment and also musculoskeletal assessment was done for assessing the severity of peripheral neuropathy.

Results: Statistical results suggests that the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions having moderate neuropathy symptoms is 0.8445, the prevalence of minor neuropathy symptoms is <0.0001 and moderately severe symptoms is <0.0001. As the maximum population has moderate neuropathy symptoms, the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions is 0.8445.

Conclusion: Among the fifty-two subjects having oedema, twenty-seven subjects had moderate neuropathy symptoms, fourteen subjects had minor neuropathy symptoms and eleven subjects had moderately severe symptoms. Thus, it clarifies that subjects having oedema are likely to get neuropathic symptoms at a later stage.

Keywords: Peripheral neuropathy, Oedema, Modified Total Neuropathy Score, VAS, Musculoskeletal Assessment.

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INTRODUCTION

Oedema is defined as an immoderate collection of free liquid in interstitial tissue spaces and serous cavities. When oedema is in the hypodermis, transient pressure of finger gives rise to despondency which indicates pitting oedema. The other type is non-pitting oedema where no pitting is generated on the force. Oedema might be of 2 fundamental sorts: Localized if a particular part of a body or extremity is involved e.g. lymphatic, inflammatory and allergic oedema and it is generalized if the allocation is fundamental, especially found in the hypodermis [1]. Severe vein related diseases comprise various signs and symptoms supposed to be associated with chronic venous deterioration in the lower limbs. Chronic venous disorders clinically represent varicose veins, vein-related skin trophic changes and venous dysfunction presents as atrophy, leg ulcers and pitting ankle oedema. Chronic amassing of oedema in both or single limb designates venous inadequacy in the case of dependent oedema and hemosiderin precipitation. Care of skin is significant to prevent skin breakdown and ulcers [2]. The pathogenesis of oedema is based on Starling's rule on capillary fluid dynamics. Starling's rule states that net filtration through the capillary membrane is proportional to the difference between the hydrostatic force across the membrane and the oncotic force. These pressures are called Starling's forces. These forces are preserved by an increased resumption of sodium from renal tubules [3]. Oedema is classified into four types depending upon mechanism causing edema: Enhanced capillary hydrostatic pressure, reduced plasma colloid osmotic pressure, increased pneumatic permeability of capillary walls, lymphatic barrier [3,4]. In increased capillary permeability, capillary poisons such as toxins and their products, histamine, anoxia, venoms, certain drugs, and chemicals damage capillary endothelium and capillary permeability of plasma proteins are elevated due to formation of gaps in endothelial cells which leads to seepage of plasma proteins into tissue fluid. So, it gives rise to a decrease in the colloid osmotic pressure and increases in the pressure of tissue fluid that leads to the formation of oedema [3,4].

Peripheral neuropathy (PN) is a chronic state influencing the peripheral nerve fibers [5]. Neuropathic pain is a compound, severe pain state that results from disease or injury to the peripheral nervous system, central nervous system or both and this results in abnormal processing of sensory input. International Association of the Study of Pain (IASP) defines neuropathic pain as "pain initiated or caused by a primary lesion or dysfunction of the nervous system." The nerve may get compressed due to various factors but one of the causes is an increase in oncotic pressure of interstitial fluid which may lead to neuropraxia. So, this may lead to symptoms of peripheral neuropathy. Symptoms of peripheral neuropathy include pain and sensory symptoms. Sensory symptoms include both positive and negative sensory symptoms. Positive symptoms include paraesthesia, spontaneous pain and increased sensation of pain and negative symptoms include

sensory loss and numbness [6,7]. In musculoskeletal pain, 15.4 % of community is exposed to pain for a half year. The musculoskeletal organization includes muscle, joint, bone and vascular structure. Sensory, motor and autonomic nervous systems are controlled by brain/spinal cord/peripheral nerve. It is necessary to investigate whether the subject's understanding of pain conveys a nociceptive part, neuropathic segment, or biomechanical issues [8]. Nielsen et al. expressed that in subjects with knee osteoarthritis, pain modulation is impaired due to dysfunction in endogenous pain inhibiting mechanism. It was likewise detailed that peripheral nociceptors are sharpened by aggravated synovium and impaired subchondral bone and even that severe nociceptive incitements drive focal sensitization and neuropathic pain [9].

Inter-relating the above points, in musculoskeletal disorders, the vascular system may get damaged which may cause damage to capillaries. Damage to capillaries will lead to damage to capillary endothelium due to various causes which will further lead to increased capillary permeability of plasma proteins which leads to the development of gaps in endothelial cells which will lead to leakage of plasma proteins in interstitial fluid. Thus, it will further cause a decrease in plasma oncotic pressure and an increase in pressure of interstitial fluid which leads to the formation of oedema [1].

But there is no evidence regarding the prevalence of neuropathic symptoms in chronic musculoskeletal oedematous conditions.

MATERIALS AND METHODS

It is an observational investigation that was done in Krishna hospital, Karad. The span of study was six months. A sum of 52 participants was involved and the sample size was calculated using formula $n = 4pq / L^2$. All the participants were comprehended in this study based on inclusion criteria. Inclusion criteria include subjects with chronic oedema in feet secondary to postoperative fracture-dislocation conditions of the lower limb, subjects with a duration of oedema more than six weeks, age 25-50 years and both males and females are included in this study. Exclusion criteria included subjects with acute oedema, neuropathic symptoms due to other than musculoskeletal conditions, subjects with a known case of polyneuropathy and subjects with neurological disorders. Subjects were assessed for peripheral neuropathy using Modified Total Neuropathy Score; pain assessment by utilizing Visual Analogue Scale (VAS) and also oedema and musculoskeletal assessments were carried out to evaluate the intensity of peripheral neuropathy.

PROCEDURE

After getting ethical approval from the institutional ethical committee (Ethical number 0454/2018-2019). This study was done in Krishna hospital, Karad. Instructed permission has been taken from the participants who fulfilled inclusion criteria. Subjects underwent a musculoskeletal assessment which included demographic data, chief

complaints and type of surgery. Participants were assessed for neuropathy using a modified total neuropathy score (mTNS), which was numbered from 0 to 20, where 0 is the minimum score and 20 is the maximum score [10]. The participant's position was supine lying and the symptoms such as numbness, tingling sensation and neuropathic pain were noted. Assessment of oedema was done using volumetric measurement and a girth measurement of left and right leg and their difference was observed [11]. The study was done by statistical analysis of all the outcome measures. Statistical analysis was done manually by using the software INSTAT to confirm the results obtained. Data on all outcome measures were calculated. The arithmetic mean, and the standard deviation was calculated for each outcome measure.

RESULTS

Primary outcomes used for the result were Musculoskeletal Assessment, Visual Analogue Scale, Assessment of oedema, Modified Total Neuropathy Score (mTNS). Statistical results suggest that the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions having moderate neuropathy symptoms is 0.8445; the prevalence of minor neuropathy symptoms is <0.0001 and moderately severe symptoms is <0.0001. As the maximum population has moderate neuropathy symptoms, the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions is 0.8445.

Table 1: Sociodemographic data

Age	No of subjects	Percentage	P-value
< 35	30	57.69%	0.1698
> 35	22	42.30%	
Gender	No of subjects	Percentage	P-value
Male	42	80%	0.0001
Female	10	10%	
Surgery	No of subjects	Percentage	P-value
ORIF	31	59.61%	0.0776
CRIF	21	40.38%	

Table No. 1 represents sociodemographic data that includes age, gender, surgery, and medical history. The age group included in this study is 25-50 years. Among 52 subjects, 30 subjects fall under the peer group of < 35 years and the rest 22 fall under the peer group of >35 years (P-value 0.1698). The study includes 42 males and 20 females (P-value 0.0001). Subjects underwent surgeries, open reduction and internal fixation and closed reduction and internal fixation. ORIF was done in 31 subjects and CRIF was done in 21 subjects (P-value 0.776).

Chief Complaints:

Among 52 subjects, 16 subjects have chief complained of pain in the left leg, out of which 15 are males and one is

female (P-value <0.0001). Sixteen subjects complained of pain in the right leg, out of which 12 are males and 4 are females (P-value 0.0133). Five subjects complained of pain in the right knee, out of which 4 are males and one is female (P-value 0.2059). Four subjects complained of pain in the left knee, and all are males (P-value 0.0339). Seven subjects complained of pain in both the legs, among which 5 are males and 2 are females (P-value 0.5930). Three subjects complained of difficulty in walking, among which one is male and 2 are females (P-value 0.4142). One subject complained of the left pain ankle (P-value 0.1573).

Table 2: Modified Total Neuropathy Score

Minimum	Maximum	Mean	Standard deviation
2	20	11.83	5.075

Table No. 2 represents the modified total neuropathy score. The minimum score is two and the maximum is 20, while the mean is 11.83, and the standard deviation is 5.075.

Table 3: Neuropathy Score Grading

Grades	Classification	Frequency	P-value
1	2-8 : Minor	14	<0.0001
2	9-16 : Moderate	27	0.8445
3	17-24 : Moderately severe	11	<0.0001
4	26-28 : Severe	0	0

Table no. 3 represents the frequency according to the severity of neuropathy symptoms. Maximum subjects have moderate symptoms, and their frequency among the total population is 27(P-value 0.8445). Maximum subjects according to frequency are further followed by Minor (P-value <0.0001) than moderately severe (P-value <0.0001). It also represents that there is 0 population suffering from severe neuropathy symptoms.

Table 4: Assessment of Oedema

Right leg			
Minimum	Maximum	Mean	Standard deviation
25	42	31.75	3.801
Left leg			
Minimum	Maximum	Mean	Standard deviation
24	42	31.28	4.548

Table no. 4 represents the assessment of oedema of the right leg having a minimum circumference of 25 cm and a maximum girth of 42 cm and the assessment of oedema of the left leg having a minimum circumference of 24 cm and a maximum girth of 42 cm.

Table 5: Difference between right and left oedema (Girth Assessment)

Minimum	Maximum	Mean	Standard deviation
0.5000	7	3.58	1.378

Table No. 5 represents the difference between girth measurement in the right and left leg. The minimum

difference is 0.5000, and the maximum is 7.

Inter-relating all the above tables, we conclude that among 52 subjects having oedema, 27 subjects had moderate neuropathy symptoms, 14 subjects had minor neuropathy symptoms, and 11 subjects had moderately severe symptoms. Thus, it clarifies that subjects having oedema are likely to get neuropathic symptoms at a later stage. Hence, the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions having moderate neuropathy symptoms is 0.8445, and minor neuropathy symptoms are <0.0001 and moderately severe symptoms is <0.0001. As the maximum population has moderate neuropathy symptoms, the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions is 0.8445.

DISCUSSION

In the present study, the peripheral neuropathy symptoms were seen in participants having chronic musculoskeletal oedematous conditions. Among the subjects selected for the study, a higher number of males had chronic musculoskeletal conditions as compared to females; thus, a higher number of males had neuropathic symptoms secondary to chronic musculoskeletal oedematous conditions.

The participants included in this study were of 25-50 years. However, out of 52 patients, 22 patients were of >35 years of age, and 30 patients were of <35 years of age. There is no evidence regarding the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions. Mesci N, Mesci E, Külcü DG. (2016) explained the relationship of neuropathic pain with ultrasonographic estimations of femoral cartilaginous structure density and clinical variables in subjects with knee osteoarthritis. Further, this neuropathic pain when increased in severity, which ultimately decreased functional capacity which affected personal satisfaction and mind-set in the subjects [9].

In the present study, among 52 subjects having oedema, 27 subjects had moderate neuropathy symptoms, 14 subjects had minor neuropathy symptoms, and 11 subjects had moderately severe symptoms. Thus, it clarifies that subjects having oedema are likely to get neuropathic symptoms at a later stage. The prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions having moderate neuropathy symptoms is 0.8445, Prevalence of minor neuropathy symptoms is <0.0001 and moderately severe symptoms is <0.0001. As the maximum population has moderate neuropathy symptoms, the prevalence of peripheral neuropathy in chronic musculoskeletal oedematous conditions is 0.8445.

The reason for developing neuropathic symptoms in musculoskeletal disorders is that the vascular system may get damaged, which may cause damage to capillaries in case of oedema. Damage to capillaries will lead to damage to capillary endothelium due to various causes which will further lead to increased capillary permeability of plasma proteins which leads to the development of gaps

in endothelial cells which will lead to leakage of plasma proteins in interstitial fluid. Thus, it will further cause a decrease in plasma oncotic pressure and an increase in oncotic pressure of interstitial fluid which leads to the formation of oedema.¹ The nerve may get compressed due to various factors but one of the causes is an increase in oncotic pressure of interstitial fluid which may lead to neuropraxia. So, this may lead to symptoms of peripheral neuropathy.⁶ The first limitation of the study is the small sample size, and one cannot generalize the result. The second limitation is research is done over a short period.

CONCLUSION

Inter-relating all the above tables, we conclude that among 52 subjects having oedema, 27 subjects had moderate neuropathy symptoms, 14 subjects had minor neuropathy symptoms, and 11 subjects had moderately severe symptoms. Thus, it clarifies that subjects having oedema are likely to get neuropathic symptoms at a later stage.

Conflicts of interest: The writers affirm that there are no disputes of attentiveness concerning the content of the present study.

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Abbreviations:

VAS: Visual Analogue Scale, PN: Peripheral Neuropathy, mTNS: Modified Total Neuropathy Score, ORIF: Open Reduction and Internal Fixation, CRIF: Closed Reduction and Internal Fixation.

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